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cial fruit-growing were being appointed, and demonstration fruit and market-garden plots, designed on lines laid down by Captain Wellington and his expert assistants, were in course of establishment. The detailed plans for these links in a national chain of demonstration and trial plots have been published, and any one who will study them will, I believe, recognize that they point the way to the successful development of a national system of intensive cultivation.

By means of these county stations the local cultivator may learn how to plant and maintain his fruit plantation and how to crop his vegetable quarters, what stock to run and what varieties to grow.

Farm stations—with the Research stations established previously by the Ministry; Long Ashton and East Malling for fruit investigations; the Lea Valley Growers' Association and Rothamstead for investigation of soil problems and pathology; the Imperial College of Science for research in plant physiology, together with a couple of stations, contemplated before the war, for local investigation of vegetable cultivation; an alliance with the Royal Horticultural Society's Research Station at Wisley, and with the John Innes Horticultural Institute for research in genetics; the Ormskirk Potato Trial Station; a Poultry Institute; and, most important of all from the point of view of education, the establishment at Cambridge of a School of Horticulture—constitute a horticultural organization which, if properly coordinated and—dare I say it?—directed, should prove of supreme value to all classes of intensive cultivators. To achieve that result, however, something more than a permissive attitude on the part of the ministry is required, and in completing the design of it I had hoped also to remain a part of that organization long enough to assist in securing its functioning as a living, plastic, resourceful, directive force—a horticultural cerebrum. Thus developed, it is my conviction that this instrument is capable of bringing Horticulture to a pitch of perfection undreamed of at the present time either in this country or elsewhere.

THE PROBLEMS OF ANTHROPOLOGY

By Professor KARL PEARSON

PRESIDENT OF THE ANTHROPOLOGICAL SECTION

ANTHROPOLOGY—the Understanding of Man—should be, if Pierre Charron were correct, the true science and the

true study of mankind.¹ We might anticipate that in our days—in this era of science—anthropology in its broadest sense would occupy the same exalted position that theology occupied in the Middle Ages. We should hail it “Queen of the Sciences,” the crowning study of the academic curriculum. Why is it that we are Section H and not Section A? If the answer be given that such is the result of historic evolution, can we still be satisfied with the position that anthropology at present takes up in our British universities and in our learned societies? Have our universities, one and all, anthropological institutes well filled with enthusiastic students, and are there brilliant professors and lecturers teaching them not only to understand man’s past, but to use that knowledge to forward his future? Have we men trained during a long life of study and research to represent our science in the arena, or do we largely trust to dilettanti—to retired civil servants, to untrained travellers or colonial medical men for our knowledge, and to the anatomist, the surgeon, or the archeologist for our teaching? Needless to say, that for the study of man we require the better part of many sciences, we must draw for contributions on medicine, on zoology, on anatomy, on archeology, on folk-lore and travel-lore, nay, on history, psychology, geology, and many other branches of knowledge. But a hotch-potch of the facts of these sciences does not create anthropology. The true anthropologist is not the man who has merely a wide knowledge of the conclusions of other sciences, he is the man who grasps their bearing on mankind and throws light on the past and present factors of human evolution from that knowledge.

I am afraid I am a scientific heretic—an outcast from the true orthodox faith—I do not believe in science for its own sake. I believe only in science for man’s sake. You will hear on every side the argument that it is not the aim of science to be utile, that you must pursue scientific studies for their own sake and not for the utility of the resulting discoveries. I think that there is a great deal of obscurity about this attitude, I will not say nonsense. I find the strongest supporters of “science for its own sake” use as the main argument for the pursuit of not immediately utile researches that these researches will be useful some day, that we can never be certain when they will turn out to be of advantage to mankind. Or, again, they will appeal to non-utile branches of science as providing a splendid intellectual

¹ “La vraie science et le vrai estude de l’homme c’est l’Homme.” Pierre Charron, *De la Sagesse*, Préface du Premier Livre, 1601. Pope, with his “The proper study of mankind is Man,” 1733, was, as we might anticipate, only a plagiarist.

training—as if the provision of highly trained minds was not itself a social function of the greatest utility! In other words, the argument from utility is in both cases indirectly applied to justify the study of science for its own sake. In the old days the study of hyperspace—space of higher dimensions than that of which we have physical cognizance—used to be cited as an example of a non-utile scientific research. In view of the facts: (i) that our whole physical outlook on the universe—and with it I will add our whole philosophical and theological outlook—are taking new aspects under the theory of Einstein; and (ii) that study of the relative influences of nature and nurture in man can be reduced to the trigonometry of polyhedra in hyperspace—we see how idle it is to fence off any field of scientific investigation as non-utile.

Yet are we to defend the past of anthropology—and, in particular, of anthropometry—as the devotion of our science to an immediate non-utile which one day is going to be utile in a glorious and epoch-making manner, like the Clifford-Einstein suggestion of the curvature of our space? I fear we can take no such flattering unction to our souls. I fear that “the best is yet to be” can not be said of our multitudinous observations on “height-sitting” or on the censuses of eye or hair colors of our population. These things are dead almost from the day of their record. It is not only because the bulk of their recorders were untrained to observe and measure with scientific accuracy, it is not only because the records in nine out of ten cases omit the associated factors without which the record is valueless. It is because the progress of mankind in its present stage depends on characters wholly different from those which have so largely occupied the anthropologist’s attention. Seizing the superficial and easy to observe, he has let slip the more subtle and elusive qualities on which progress, on which national fitness for this or that task essentially depends. The pulse-tracing, the reaction-time, the mental age of the men under his control are far more important to the commanding officer—nay, I will add, to the employer of labor—than any record of span, of head-measurement, or pigmentation categories. The psycho-physical and psycho-physiological characters are of far greater weight in the struggle of nations to-day than the superficial measurement of man’s body. Physique, in the fullest sense, counts something still, but it is physique as measured by health, not by stature or eye-color. But character, strength of will, mental quickness count more, and if anthropometry is to be useful to the state it must turn from these rusty old weapons, these measurements of

stature and records of eye-color to more certain appreciation of bodily health and mental aptitude—to what we may term “vigorimetry” and to psychometry.

Some of you may be inclined to ask: And how do you know that these superficial size-, shape-, and pigment-characters are not closely associated with measurements of soundness of body and soundness of mind? The answer to this question is two-fold, and I must ask you to follow me for a moment into what appears a totally different subject. I refer to a “pure race.” Some biologists apparently believe they can isolate a pure race, but in the case of man, I feel sure that purity of race is a merely relative term. For a given character one race is purer than a second, if the scientific measure of variation of that character is less than it is in the second. In loose wording, for we can not express ourselves accurately without mathematical symbols, that race is purer for which on the average the individuals are closer to type for the bulk of ascertainable characters than are the characters in a second race. But an absolutely pure race in man defies definition. The more isolated a group of men has remained, the longer it has lived under the same environment, and the more limited its habitat, the less variation from type it will exhibit, and we can legitimately speak of it as possessing greater purity. We, most of us, probably believe in a single origin of man. But as anthropologists we are inclined to speak as if at the dawn of history there were a number of pure races, each with definite physical and mental characteristics; if this were true, which I do not believe, it could only mean that up to that period there had been extreme isolation, extremely differentiated environment, and so marked differences in the direction and rate of mental and physical evolution. But what we know historically of folk-wanderings, folk-mixings, and folk-absorptions have undoubtedly been going on for hundreds of thousands of years, of which we know only a small historic fragment. Have we any real reason for supposing that “purity of race” existed up to the beginning of history, and that we have all got badly mixed up since?

Let us, however, grant that there were purer races at the beginning of history than we find to-day. Let us suppose a Nordic race with a certain stature, a given pigmentation, a given shape of head, and a given mentality. And again, we will suppose an Alpine race, differing markedly in type from the Nordic race. What happens if we cross members of the two races and proceed to a race of hybrids? A Mendelian would tell us that these characters are sorted out like cards from a pack in all sorts

of novel combinations. A Nordic mentality will be found with short stature and dark eyes. A tall but brachycephalic individual will combine Alpine mentality with blue eyes. Without accepting fully the Mendelian theory we can at least accept the result of mass observations, which show that the association between superficial physical measurements and mentality is of the slenderest kind. If you keep within one class, my own measurements show me that there is only the slightest relation between intelligence and the size and shape of the head. Pigmentation in this country seems to have little relation to the incidence of disease. Size and shape of head in man have been taken as a rough measure of size and shape of brain. They can not tell you more—perhaps not as much as brain-weight—and if brain-weight were closely associated with intelligence, then man should be at his intellectual prime in his teens.

Again, too often is this idea of close association of mentality and physique carried into the analysis of individuals within a human group, *i.e.*, of men belonging to one or another of the many races which have gone to build up our population. We talk as if it was our population which was mixed, and not our germplasm. We are accustomed to speak of a typical Englishman. For example, Charles Darwin; we think of his mind as a typical English mind, working in a typical English manner, yet when we come to study his pedigree we seek in vain for "purity of race." He is descended in four different lines from Irish kinglets; he is descended in as many lines from Scottish and Pictish kings. He has Manx blood. He claims descent in at least three lines from Alfred the Great, and so links up with Anglo-Saxon blood, but he links up also in several lines with Charlemagne and the Carolingians. He sprang also from the Saxon Emperors of Germany, as well as from Barbarossa and the Hohenstaufens. He had Norwegian blood and much Norman blood. He had descent from the Duke of Bavaria, of Saxony, of Flanders, the Princes of Savoy, and the Kings of Italy. He had the blood in his veins of Franks, Alamans, Merovingians, Burgundians, and Longobards. He sprang in direct descent from the Hun rulers of Hungary and the Greek Emperors of Constantinople. If I recollect rightly, Ivan the Terrible provides a Russian link. There is probably not one of the races of Europe concerned in folk-wanderings which has not a share in the ancestry of Charles Darwin. If it has been possible in the case of one Englishman of this kind to show in a considerable number of lines how impure is his race, can we venture to assert that if the like knowledge were possible of attainment, we could

expect greater purity of blood in any of his countrymen? What we are able to show may occur by tracing an individual in historic times, wherever physical barriers did not isolate a limited section of mankind? If there ever was an association of definite mentality with physical characters, it would break down as soon as race mingled freely with race, as it has done in historic Europe. Isolation or a strong feeling against free inter-breeding—as in a color differentiation—could alone maintain a close association between physical and mental characters. Europe has never recovered from the general hybridization of the folk-wanderings, and it is only the cessation of wars of conquest and occupation, the spread of the conception of nationality and the reviving consciousness of race, which is providing the barriers which may eventually lead through isolation to a new linking-up of physical and mental characters.

In a population which consists of non-intermarrying castes, as in India, physique and external appearance may be a measure of the type of mentality. In the highly and recently hybridized nations of Europe there are really but few fragments of "pure races" left, and it is hopeless to believe that anthropometric measurements of the body or records of pigmentation are going to help us to a science of the psycho-physical characters of man which will be useful to the state. The modern state needs in its citizens vigor of mind and vigor of body, but these are not characters with which the anthropometry of the past has largely busied itself. In a certain sense the school medical officer and the medical officer of health are doing more state service of an anthropological character than the anthropologists themselves.

These doubts have come very forcibly to my notice during the last few years. What were the anthropologists as anthropologists doing during the war? Many of them were busy enough and doing valuable work because they were anatomists, or because they were surgeons, or perhaps even because they were mathematicians. But as anthropologists, what was their position? The whole period of the war produced the most difficult problems in folk-psychology. There were occasions innumerable where thousands of lives and most heavy expenditure of money might have been saved by a greater knowledge of what creates and what damps folk movements in the various races of the world. India, Egypt, Ireland, even our present relations with Italy and America, show only too painfully how difficult we find it to appreciate the psychology of other nations. We shall not surmount these difficulties until anthropologists take a wider view of the material they have to record and of the task

they have before them if they wish to be utile to the state. It is not the physical measurement of native races which is a fundamental feature of anthropometry to-day; it is the psychometry and what I have termed the vigorimetry of white- as well as of dark-skinned men that must become the main subjects of our study.

Some of you may consider that I am overlooking what has been contributed both in this country and elsewhere to the science of folk-psychology. I know at least that Wilhelm Wundt's² great work runs to ten volumes. But I also know that in its 5,452 pages there is not a single table of numerical measurements, not a single statement of the *quantitative* association between mental racial characters, nor, indeed, any attempt to show numerically the intensity of association between folk-mentality and folk customs and institutions. It is folk-psychology in the same stage of evolution as present-day sociology is in, or as individual psychology was in before the advent of experimental psychology and the correlational calculus. It is purely descriptive and verbal. I am not denying that many sciences must for a long period still remain in this condition, but at the same time I confess myself a firm disciple of Friar Roger Bacon³ and of Leonardo da Vinci,⁴ and believe that we can really know very little about a phenomenon until we can actually measure it and express its relations to other phenomena in quantitative form. Now you will doubtless suggest that sections of folk-psychology like Language, Religion, Law, Art—much that forms the substance of cultural anthropology—are incapable of quantitative treatment. I am not convinced that this standpoint is correct. Take only the first of these sections—*Language*. I am by no means certain that there is not a rich harvest to be reaped by the first man who can give unbroken time and study to the statistical analysis of language. Whether he start with roots or with words to investigate the degree of resemblance in languages of the same family, he is likely, before he has done, to learn a great deal about the relative closeness and order of evolution of cognate tongues, whether those tongues be Aryan or Sudanese. And the methods applicable in the case of language

² Its last volume also bears evidence of the non-judicial mind of the writer, who expresses strong opinions about recent events in the language of the party historian rather than the man of science.

³ He who knows not Mathematics can not know any other science, and what is more can not discover his own ignorance or find its proper remedies.

⁴ Nissuna humana investigatione si po dimandare vera scientia s'essa non passa per le matematiche dimonstratione.

will apply in the same manner to cultural habits and ideas. Strange as the notion may seem at first, there is a wide field in cultural anthropology for the use of those same methods which have revolutionized psychometric technique, to say nothing of their influence on osteometry.

The problems of cultural anthropology are subtle, but so indeed are the problems of anthropometry, and no instrument can be too fine if our analysis is to be final. The day is past when the arithmetic of the kindergarten sufficed for the physical anthropologist; the day is coming when mere verbal discussion will prove inadequate for the cultural anthropologist.

I do not say this merely in the controversial spirit. I say it because I want to find a remedy for the present state of affairs. I want to see the full recognition of anthropology as a leading science by the state. I want to see the recognition of anthropology by our manufacturers and commercial men, for it should be at least as important to them as chemistry or physics—the foundations of the anthropological institutes with their museums and professors in Hamburg and Frankfurt, have not yet found their parallels in commercial centers here. I want to see a fuller recognition of anthropology in our great scientific societies, both in their choice of members and in the memoirs published. If their doors are being opened to psychology under its new technique, may not anthropology also seek for fuller recognition?

It appears to me that if we are to place anthropology in its true position as the queen of the sciences, we must work shoulder to shoulder and work without intermittence in the following directions: anthropologists must not cease:

(i) To insist that our recorded material shall be such that it is at present or likely in the near future to be utile to the state, using the word "state" in its amplest sense.

(ii) To insist that there shall be institutes of anthropology, each with a full staff of qualified professors, whose whole energy and time shall be devoted to the teaching of and research in anthropology, ethnology and prehistory. At least three of our chief universities should be provided with such institutes.

(iii) To insist that our technique shall not consist in the mere statement of opinion on the facts observed, but shall follow, if possible with greater insight, the methods which are coming into use in epidemiology and psychology.